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THE DU MONT TYPE 281 CATHODE-RAY INDICATOR AND THE TYPE 286 HIGH-VOLTAGE POWER SUPPLY

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The observation or recording by photography of high-speed single transients with most general-purpose cathode-ray oscillographs has proved practically impossible due to insufficient light output from the screen of the cathode-ray tube. To overcome this handicap, the Allen B. Du Mont Laboratories have developed the Types 247-A and 248-A Cathode-ray Oscillographs which are modifications of the Types 247 and 248 respectively.[1, 2] These designs incorporate the Type 5RP-A series of cathode-ray tubes[3, 4] which are designed to operate at a high ratio (10:1) of final intensifier-electrode voltage to second-anode voltage. The intensifier voltage is applied in three steps, increasing the screen excitation and hence the light output without materially decreasing the deflection sensitivity.

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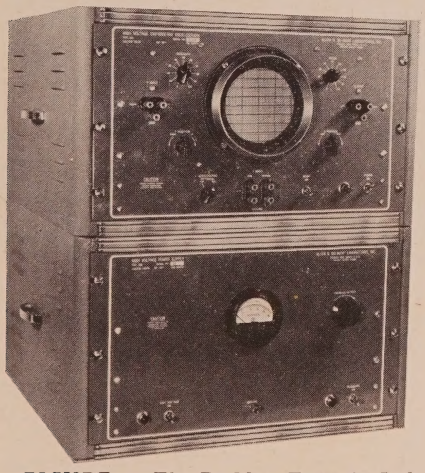

FIGURE 1—The Du Mont Type 281 Cathode-ray Indicator and the Type 286 High-voltage Power Supply.

It is recognized, however, that the Types 247-A and 248-A are not adequate for exploiting the full capacities of the Type 5RP-A tube for visual observation and photographic recording of very-high-speed single transients. To meet this need, and to provide a basic cathode-ray oscillograph indicator unit to which may be added specialized signal-amplifier and time-base generator units, Du Mont has developed the Type 281 Cathode-ray Indicator. The Type 281 incorporates the Type 5RP-A cathode-ray tube and internal second-anode and intensifier supplies (4 or 8 kv over-all accelerating voltage)* and provisions for focusing, positioning, and modulating the beam.

For those applications which require even greater light output, provision is made for an external intensifier-potential supply of 25 kilovolts such as the Du Mont Type 286 High-voltage Power Supply. Figures 3 and 4 are examples of the recording capabilities of the Type 281 without and with the Type 286. The internal second-anode supply of either 2 or 4 kv* and the Type 286 Power Supply for the intensifier electrodes are regulated to main-

*Selected by a switch on the front panel.

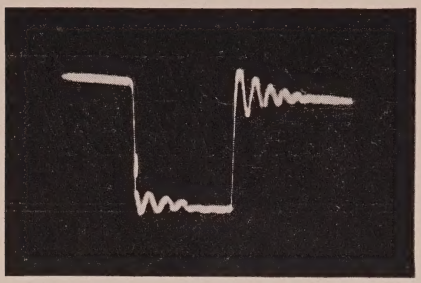

FIGURE 2—An oscillogram of a high-speed single pulse of 1.1 μsec duration. The horizontal sweep speed during the time of the pulse is 1/2 in./μsec. Damped oscillations on top of the pulse and after the trailing edge of the pulse are caused by open wire leads used in making connections to the deflection plates. The writing speed during the rise time of the pulse approaches 40 in./μsec.

tain the cathode-ray beam at the same accelerating voltage regardless of changes in beam current or power-line voltage. To provide a stable trace, the positioning voltage is regulated so that a change of ±10 per cent of line voltage does not move the spot more than 0.1 inch in any direction. Sufficient range of voltage is provided to position the beam off-screen in any direction for any accelerating potential within the rating of the instrument.

Connections to the deflection plates may be made from the front panel through capacitors, or directly to the deflection plates through a door in the top of the cabinet. Input terminals are provided on the front panel for both the grid and the cathode of the cathode-ray tube. This permits the use of beam-modulating signals of either polarity. For convenience, a beam switch is provided for turning the beam off when it is not needed without necessitating a change of the intensity control setting or cutting off the power.

When used with the Type 286 High-voltage Power Supply and the Type 5RP11A cathode-ray tube, oscillograms plotted at writing rates in excess of 350 kilometers per second (14 in./μsec) have been recorded on commercial film with an f/3.5 lens. With an f/1 lens this speed could be increased by a factor of 12, or in excess of 4200 kilometers per second (168 in./μsec). Such high writing rates suggest the use of the Du Mont Types 281 and 286 as components of surge testing equipment replacing the cold-cathode oscillograph. Equipped with the Du Mont Type 2088 Projection Lens, the Type 281 is an ideal instrument for lecture and demonstration purposes where it is desired to display single high-speed transients.

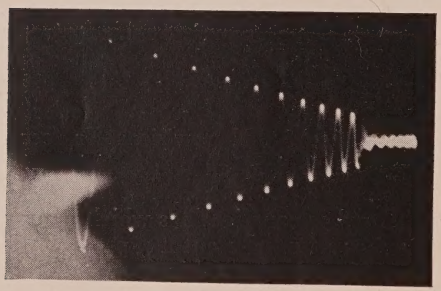

FIGURE 3—Unretouched oscillogram of a high-speed single transient photographed from the screen of the Type 281 Cathode-ray Indicator operating with an overall accelerating potential of 8 kv. The photograph was taken with the Du Mont Type 271-A Oscillograph-record Camera, having a lens speed of f/3.5. The writing speed of the first cycle, which can only be distinguished by the bright spots at the peaks is 325 km/sec (13 in./μsec), while the writing speed of the tenth cycle is 88 km/sec (3.5 in./μsec).

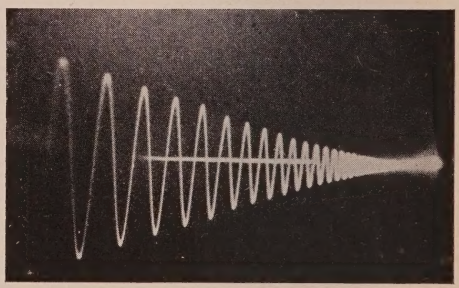

FIGURE 4—Unretouched oscillogram of the same high-speed transient as that shown in Figure 3 photographed from the Type 281 Cathode-ray Indicator with the Type 286 power supply used as an auxiliary. The overall accelerating potential in this case is 29 kv. The writing speeds in this oscillogram for the first and tenth cycles are the same as those in Figure 3. Note the large difference in intensity between comparable cycles on the two oscillograms.

Flexibility of use is also enhanced by the type of construction utilized for this instrument. Although the Type 281 Cathode-ray Indicator is basically designed for relay-rack mounting, it is supplied with its own dust-proof cabinet so that it may be used as a portable instrument if required. The cathode-ray tube is mounted to provide adequate insulation for the operator against the high accelerating potentials used.

The bezel for the Type 5RP-A permits attachment of the Du Mont Type 271-A Camera, the Type 2088 Projection Lens or the Type 314 Camera. A graduated scale, with one-tenth inch divisions, is permanently mounted over the face of the cathode-ray tube.

Specifications

Cathode-ray Tube

Types 5RP2A or 5RP11A (also available with P1, P5, or P7 screens on special order).

Total Accelerating Potential—4 or 8 kv, with provision for an external 25 kv intensifier supply.

Deflection Factor—Same as Type 5RP-A.

Power Supply

Second Anode—2 kv (nominal), ±2% variation for change in load from 0 to 1 ma or ±10% line voltage change (will deliver 2.5 ma for 400 μsec with a duty cycle of 50%).

4 kv (nominal), ±2% variation for change in load from 0 to 2 ma or ±10% line voltage change (will deliver 5 ma for 400 μsec with a duty cycle of 50%).

Positive Intensifier Potential Supply—Unregulated at 2 or 4 kv (ganged with second anode).

Position Supply—Regulated to hold beam within 0.1 in. over screen of the tube with ±10% line voltage change.

Power Source—115/230 volts

Frequency—50-60 cps

Power—100 watts

Physical Specifications

Height	12¼ in.	Length	20½ in.
Width	20¾ in.	Weight	120 lb

Catalog No.	*Type*	*Description*	*Code Word*
[1]1280-E	281	Cathode-ray Indicator for 115 v. 50-60 cycles with Type 5RP2A Cathode-ray Tube	YALDF
[2]1283-E	281	Same as 1280-E with Type 5RP11A Cathode-ray Tube	YALDJ
[1]1324-E	281	Cathode-ray Indicator for 230 v. 50-60 cycles with Type 5RP2A Cathode-ray Tube	YALEZ
[2]1327-E	281	Same as 1324-E with Type 5RP11A Cathode-ray Tube	YALFC

[1]Recommended as the general-purpose screen type.
[2]Recommended as the screen type for photographic work in which the writing speed of the Type 5RP2A, used in conjunction with Du Mont Type 2126-H blue filter, is inadequate.

TYPE 286 H-v POWER SUPPLY

The Du Mont Type 286 High-voltage Power Supply has been designed primarily for use as an accessory with cathode-ray oscillographs, particularly the Du Mont Type 281 Cathode-ray Indicator. This power supply may be used to extend the usefulness of an oscillograph by providing higher accelerating potentials than conveniently can be self-contained. An increase of accelerating voltage permits observation and photography of traces of higher writing rates. The Type 286 may also be used where a rugged and relatively safe high-voltage supply of small current is required.

The Type 286 is a rectified-radio-frequency type of regulated power supply. It consists of a radio-frequency oscillator with its power supply, an r-f step-up transformer, a voltage

doubler-rectifier, and a high-voltage filtering and metering system. The d-c output voltage is continuously variable from 18,000 to 25,000 volts with loads up to 500 microamperes. Upon the front panel are mounted an output kilovoltmeter with a scale calibrated from 0 to 25 kv, and a control for varying the output voltage. A four-foot length of shielded output cable with suitable connectors is furnished with the unit.

The Type 286 radio-frequency power supply has several advantages over conventional types of power supplies. It is safer in case of accidental contact with the high voltage, because very little power is stored in the filtering circuits. Furthermore, no damage will result if the output is short-circuited. It is also lighter because the transformer core is air instead of iron, and because the filtering circuits are much simpler and smaller.

This instrument is designed for standard relay-rack mounting, and it is mounted in an individual dust-proof cabinet. Provision is made to lock this cabinet together with that of the Type 281 Cathode-ray Indicator to form a single high-voltage cathode-ray indicator. Stray fields from the Type 286 are such as to cause no reaction on the cathode-ray tube of the Type 281, or to other nearby electronic equipment.

Specifications

Electrical

Output Voltage Range (at currents to 500 microamperes) ..... 18 to 25 kv
(Output voltage is positive with respect to ground; negative terminal is connected to the chassis.)

Regulation—Within 5% from no load to 500 microamperes load or ±10% change in line voltage.

Ripple Voltage ..... Less than 0.5%

Power Supply

Voltage ..... 115/230 v
Frequency ..... 50-60 cps
Power Consumption ..... 200 watts

Physical

Height ..... 12¼ in.
Width ..... 20¾ in.
Depth ..... 20½ in.
Weight ..... 90 lb

Catalog No.	*Type*	*Description*	*Code Word*
1285-E	286	High-voltage Power Supply for 115 v. 50-60 cycles	YALDL
1286-E	286	High-voltage Power Supply for 230 v. 50-60 cycles	YALDM

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DUMONT *Precision Electronics and Television*

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